

Notice of Allowability

Application No.

09/784,761

Examiner

Philip C. Lee

Applicant(s)

PETTEY, CHRISTOPHER J.

Art Unit

2152

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 7/12/06.
2. ☒ The allowed claim(s) is/are 1-5, 7-12, 14-19, 21-27, 29-33 and 35-45.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application

6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 9/9/06

7. ☒ Examiner's Amendment/Comment

8. ☒ Examiner's Statement of Reasons for Allowance

9. ☐ Other


BUNJOB JAROENCHONWANIT
SUPERVISORY PATENT EXAMINER

1. An Examiner's Amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 C.F.R.

1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the Issue Fee.

2. Authorization for the examiner's amendment was given in a telephone interview with Richard K. Huffman, reg. no. 41,082, on September 09, 2006.

3. The application has been amended as follows:

a. Replace claim 1 to read as of the following,

In Claim 1,

1. (Currently Amended) A TCP-aware target adapter, for accelerating TCP/IP connections between a plurality of clients and a plurality of servers, the plurality of servers being accessed via an Infiniband fabric, the plurality of clients being accessed via a TCP/IP network, the TCP-aware target adapter comprising:

an accelerated connection processor, configured to bridge TCP/IP transactions between the plurality of clients and the plurality of servers, wherein said accelerated connection processor accelerates the TCP/IP connections by bypassing a TCP/IP stack employed in one or more of the plurality of servers by ~~prescribing~~ issuing Infiniband remote direct

memory access operations to retrieve/provide transaction data from/to the plurality of servers, wherein said accelerated connection processor comprises:

a connection correlator, configured to ~~asseeiate~~ map TCP/IP connection parameters with a target work queue number for each of a plurality of accelerated TCP/IP connections, wherein said target work queue number corresponds to a work queue pair; and

a target channel adapter, coupled to said accelerated connection processor, configured to support Infiniband operations with the plurality of servers, and configured to execute said Infiniband remote direct memory access operations to retrieve/provide said transaction data responsive to said Infiniband remote direct memory access operations issued to said work queue pair, wherein said accelerated connection processor handles TCP/IP processing of said transaction data;

whereby the TCP/IP connections are accelerated by offloading TCP/IP processing ~~otherwise~~ performed by the plurality of servers to retrieve/provide said transaction data.

b. Replace claim 9 to read as of the following,

In Claim 9,

9. (Currently Amended) An apparatus in a server connected to an Infiniband fabric for implementing accelerated TCP/IP connections between the server and clients, the clients being connected to a TCP/IP network, the apparatus comprising:

Art Unit: 2152

a connection acceleration driver, configured to manage the accelerated TCP/IP connections, wherein said connection acceleration driver designates memory locations within server memory such that transaction data can be retrieved/provided via Infiniband remote direct memory access operations, wherein said connection acceleration driver comprises: correlation logic, configured to ~~associate~~ map TCP/IP connection parameters with a host work queue number for each of the accelerated TCP/IP connections, wherein said host work queue number corresponds to a work queue pair; and

a host channel adapter, coupled to said connection acceleration driver, configured to execute Infiniband operations via the Infiniband fabric, and configured to execute direct memory access functions to retrieve/provide said transaction data responsive to said Infiniband remote direct memory access operations issued to said work queue pair, wherein an accelerated connection processor handles TCP/IP processing of said transaction data;

whereby the accelerated TCP/IP connections offload TCP/IP processing ~~otherwise~~ performed by the server by bypassing a TCP/IP stack employed in the server to retrieve/provide said transaction data.

c. Replace claim 16 to read as of the following,

In Claim 16,

Art Unit: 2152

16. (Currently Amended) An apparatus within a client-server environment for managing an accelerated TCP/IP connection between a server connected to an Infiniband fabric and a client connected to a TCP/IP network, the apparatus comprising;
- a host driver, for providing a host work queue pair through which transaction data corresponding to the accelerated TCP/IP connection is transmitted/received via the Infiniband fabric; and
- a TCP-aware target adapter, coupled to said host driver, for providing a target work queue pair corresponding to said host work queue pair, and for executing a remote direct memory access operation to receive/transmit said transaction data via the Infiniband fabric, wherein said TCP-aware target adapter receives/transmits said transaction data responsive to said remote direct memory access operation issued to said target work queue pair, and wherein said TCP-aware target adapter handles TCP/IP processing of said transaction data, wherein said TCP-aware target adapter comprises:
- a connection correlator, for ~~associating~~ mapping TCP/IP connection parameters for the accelerated connection with a target work queue number corresponding to said target work queue pair;
- whereby the accelerated TCP/IP connection offloads TCP/IP processing ~~otherwise~~ performed by the server by bypassing a TCP/IP stack employed in the server to receive/transmit said transaction data.

- d. Replace claim 23 to read as of the following,

In Claim 23,

23. (Currently Amended) A method for accelerating TCP/IP connections in a client-server environment having clients that are connected to a TCP/IP network and servers that are connected to an Infiniband fabric, the method comprising:
- mapping TCP/IP connection parameters for accelerated connections to corresponding host and target work queue numbers that correspond to host and target work queue pairs; [[and]] offloading TCP/IP processing otherwise performed by the servers by bypassing a TCP/IP stack employed in one or more of the servers by executing Infiniband remote direct memory access operations to retrieve/transmit data associated with the accelerated connections from/to memory within the servers[[.]]; issuing the Infiniband remote direct memory access operations to said target work queue pairs;
- and
- providing the data to/from a TCP-aware target adapter responsive to said issuing; wherein the TCP-aware target adapter handles TCP/IP processing of said data.

- e. Replace claim 27 to read as of the following,

In Claim 27,

27. (Currently Amended) A method for offloading server TCP/IP processing in a client-server environment, comprising:

bypassing a TCP/IP stack ~~otherwise~~ employed in a server utilizing remote direct memory access

operations via an Infiniband fabric to directly access data from /to server memory,
wherein the data is provided to/from a TCP-aware target adapter, the TCP-aware target
adapter providing native network ports that connect to clients, wherein said utilizing
comprises:

~~associating~~ mapping TCP/IP connection parameters for a particular TCP/IP connection
with a work queue number that corresponds to a work queue pair within the TCP-
aware target adapter; [[and]]

issuing remote direct memory access requests to the work queue pair; and

providing the data to/from the TCP-aware target adapter responsive to said issuing,

wherein the TCP-aware target adapter handles TCP/IP processing of said data;
and

via the TCP-aware target adapter, generating native network transactions to
transfer the data to/from clients.

f. Replace claim 30 to read as of the following,

In Claim 30,

30. (Currently Amended) A TCP-aware target adapter, for accelerating TCP/IP connections
between a plurality of clients and a plurality of server, the plurality of servers being accessed via

an Infiniband fabric, the plurality of clients being accessed via a TCP/IP network, the TCP-aware target adapter comprising:

an accelerated connection processor, configured to bridge TCP/IP transactions between

the plurality of clients and the plurality of servers, wherein said accelerated connection processor accelerates the TCP/IP connections by bypassing a TCP/IP stack employed in one or more of the plurality of servers by ~~prescribing~~ issuing remote direct memory access operations to retrieve/provide transaction data from/to the plurality of servers, and wherein said accelerated connection processor comprises:

a connection correlator, configured to ~~associate~~ map TCP/IP connection parameters

which uniquely identify the TCP/IP connections with corresponding work queue

numbers, wherein said work queue numbers correspond to work queue pairs; and

a target channel adapter, coupled to said accelerated connection processor, configured to support

Infiniband operations with the plurality of servers, and configured to ~~execute said remote~~

~~direct memory access operations to~~ retrieve/provide said transaction data responsive to

said remote direct memory access operations issued to said work queue pairs, wherein

said accelerated connection processor handles TCP/IP processing of said transaction data,

and configured to route said transaction data to/from the plurality of clients as embedded payloads within Infiniband packets;

whereby the TCP/IP connections are accelerated by offloading TCP/IP processing ~~otherwise~~

performed by the plurality of servers to retrieve/provide said transaction data.

g. Replace claim 40 to read as of the following,

In Claim 40,

40. (Currently Amended) An Infiniband-to-native protocol translation apparatus, for routing TCP/IP transactions between a plurality of clients and a plurality of Infiniband devices, the plurality of Infiniband devices being accessed via an Infiniband fabric, the plurality of clients being accessed via a TCP/IP network, the Infiniband-to-native protocol translation apparatus comprising:
- an unaccelerated connection processor, configured to bridge the TCP/IP transactions between the plurality of clients and the plurality of Infiniband devices by encapsulating /stripping the ~~TCP transactions~~ TCP/IP packets within/from Infiniband raw packets, said unaccelerated connection processor comprising:
- an unaccelerated connection correlator, for mapping native addresses to/from Infiniband local identifiers and work queue numbers, wherein said work queue numbers correspond to work queue pairs; and
- a target channel adapter, coupled to said unaccelerated connection processor, configured to receive/transmit said Infiniband raw packets from/to the plurality of Infiniband devices responsive to remote direct memory access operations issued to said work queue pairs; wherein said unaccelerated connection processor encapsulates/strips said TCP/IP packets within/from Infiniband raw packets according to said mapping.

Reason for Allowance

4. The following is an examiner's statement of reasons for allowance: None of the prior art of records teach or suggest in combination a TCP-aware target adapter for accelerating TCP/IP connections between a plurality of clients and a plurality of servers, the plurality of servers being accessed via an Infiniband fabric, the plurality of clients being accessed via a TCP/IP network, the TCP-aware target adapter comprising:

an accelerated connection processor, configured to bridge TCP/IP transactions between the plurality of clients and the plurality of servers, wherein said accelerated connection processor accelerates the TCP/IP connections by bypassing a TCP/IP stack employed in one or more of the plurality of servers by prescribing issuing Infiniband remote direct memory access operations to retrieve/provide transaction data from/to the plurality of servers, wherein said accelerated connection processor comprises:

a connection correlator, configured to associate map TCP/IP connection

parameters with a target work queue number for each of a plurality

of accelerated TCP/IP connections, wherein said target work queue number

corresponds to a work queue pair; and


a target channel adapter, coupled to said accelerated connection processor, configured to support Infiniband operations with the plurality of servers, and configured to execute said Infiniband remote direct memory access operations to retrieve/provide said

Art Unit: 2152

transaction data responsive to said Infiniband remote direct memory access operations issued to said work queue pair, wherein said accelerated connection processor handles TCP/IP processing of said transaction data;

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip C Lee whose telephone number is (571)272-3967. The examiner can normally be reached on 8 AM TO 5:30 PM Monday to Thursday and every other Friday. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bunjob Jaroenchonwanit can be reached on (571) 272-3913. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

P.L.



BUNJOB JAROENCHONWANIT
SUPERVISORY PATENT EXAMINER